Managing Institutional Risk to Mission

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Agency Strategic Goals

1. Fly the Shuttle as safely as possible until its retirement, not later than 2010.
2. Bring a new Crew Exploration Vehicle into service as soon as possible after Shuttle retirement.
3. Develop a balanced overall program of science, exploration, and aeronautics consistent with the redirection of the human spaceflight program to focus on exploration.
4. Complete the International Space Station in a manner consistent with NASA's International partner commitments and the needs of human exploration.
5. Encourage the pursuit of appropriate partnerships with the emerging commercial space sector.
6. Establish a lunar return program having the maximum possible utility for later missions to Mars and other destinations.

Agency Challenges

- NASA’s missions present intense technical, financial and management challenges
- Operating environment extremely constrained from cost and schedule perspectives
- External requirements exacerbate problem

Bottom Line

- Increased performance in all systems is a must, especially throughout the institutional base
- Centers are where the “rubber meets the road.”
- Mission managers, institutional managers and Centers must work smart, and in concert.

Mission Support Functions*

Mission support functions include the following:

- Procurement
- Resources Management
- Finance & Task Order
- Legal
- Real and Personal Property
- Export Compliance
- Security
- Human Resources
- Facilities and Assets
- Public Affairs
- Technical Documentation
- Configuration Management
- Information Management
- NEPA Compliance

It is critical that these functions be performed effectively and efficiently and jointly with mission to permit mission success

* JPL Chart

Mission Support Functions*

- Mission support functions generally have in common the following characteristics:
  - Do not perform the technical work of the project, but do provide the supporting environment (infrastructure) which allows the technical work to go on.
  - Require specific discipline expertise (often professionals).
  - Require compliance with laws, treaties, Executive Orders, and regulations.
  - Involve interfacing and often negotiating with regulatory authorities.

- Mission support functions are best performed when there is an early and continuous close connection between project personnel and mission support personnel.

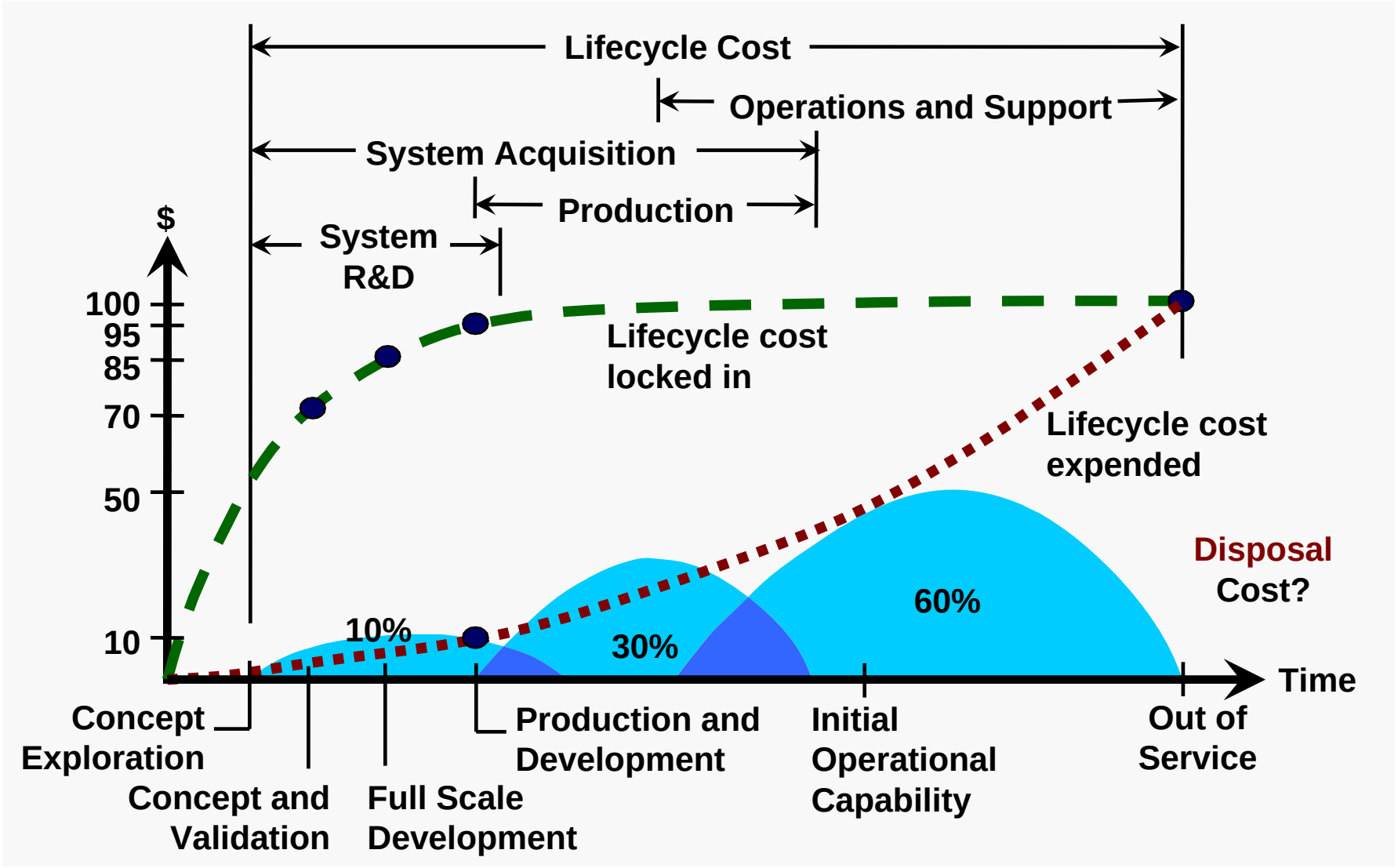
*JPL Chart

Mission Support*

- Mission support organizations provide services to the institution as a whole and to the individual flight projects.
  - Needs of the former are tend to be more uniform with time and not time critical
  - Needs of the latter tend to be episodic and almost always time critical
- Two sets of customers for mission support functions may have conflicting goals, timeframes and strategies, causing disorder in the system.

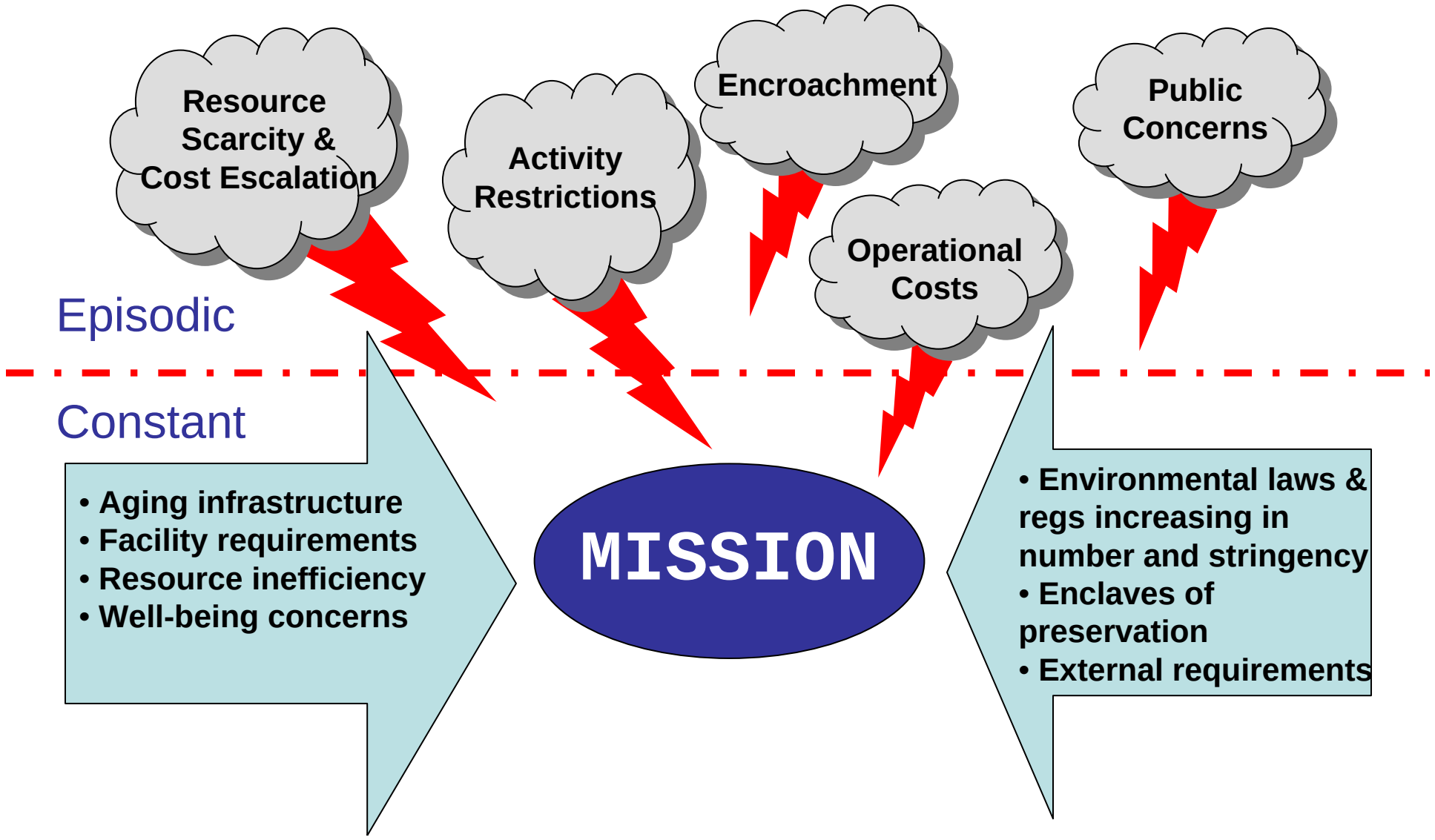
* JPL Chart

Percentage of Cost Locked In by Phase

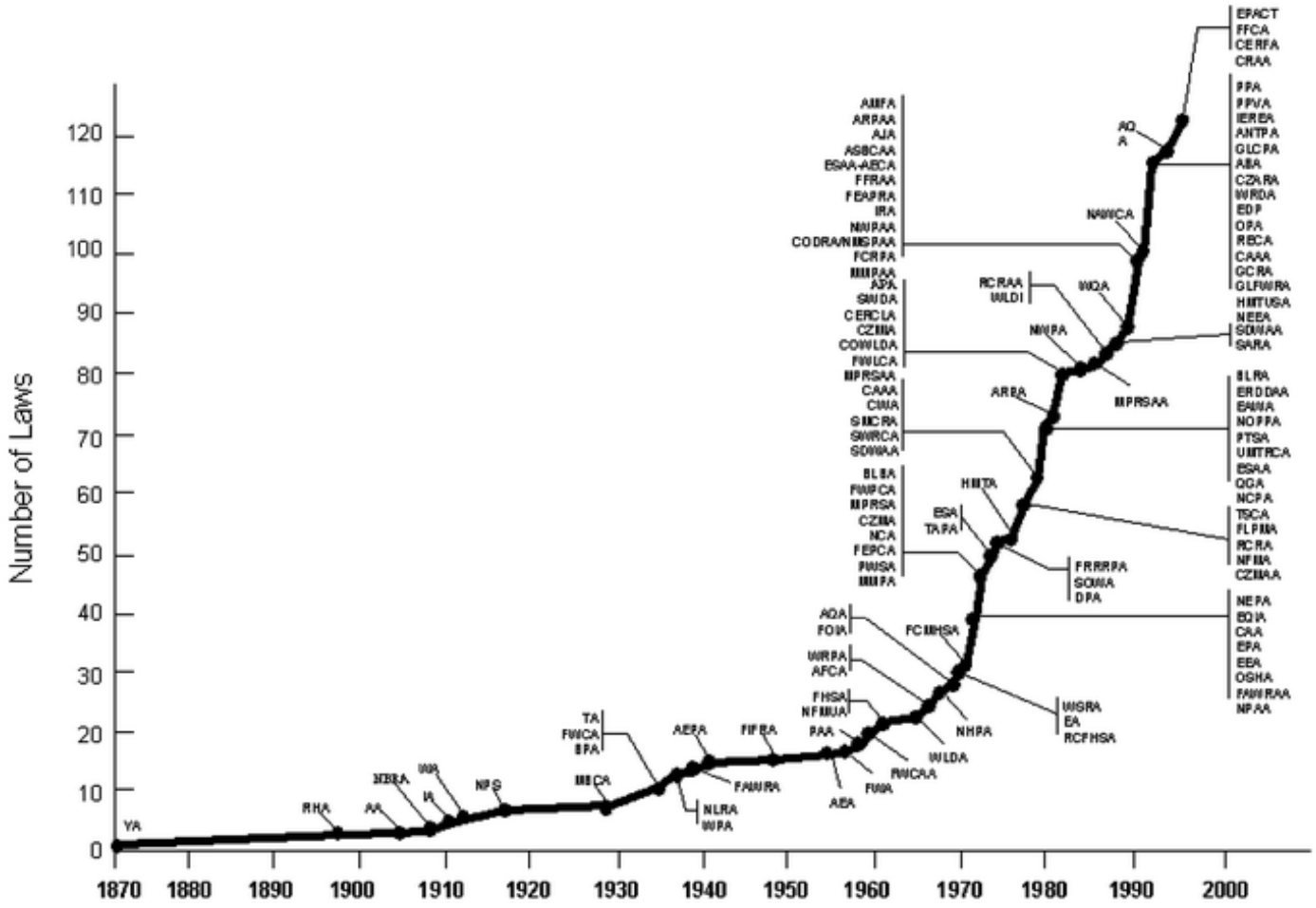


From W. J. Larson & L. K. Pranke (1999) Human Spaceflight: Mission Analysis and Design

Institutional Risks Threaten NASA's Ability to Conduct Mission

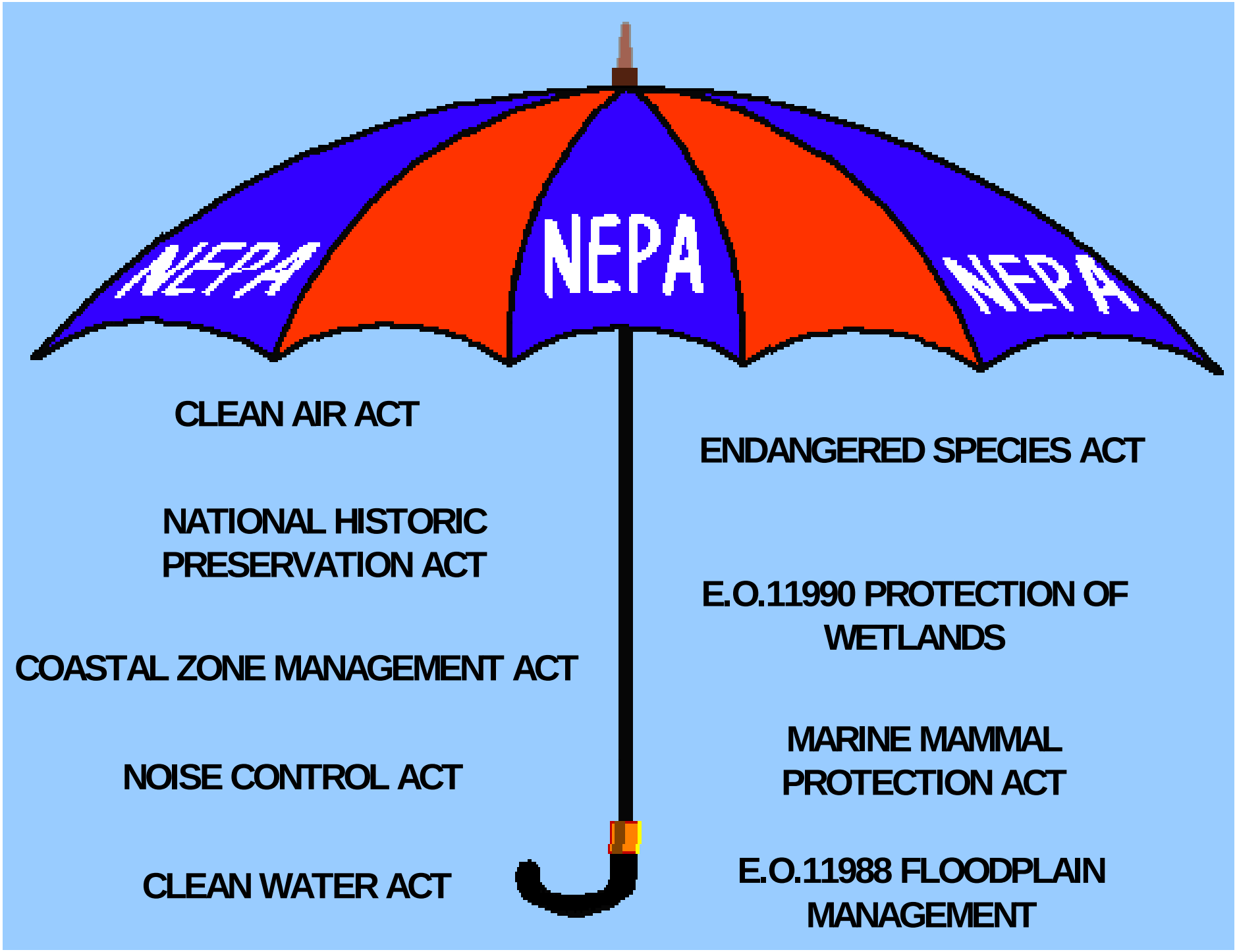


Environmental Regulation Growth



Source: J. A. Cusumano, New Technology for the Environment, Chemtech, 1992, 22(8), 482–489

P. T. Anastas, Meeting the Challenges of Sustainability through Green Chemistry, Journal of Green Chemistry, 2003, 5(2), G29-G34.


NEPA
NEPA
NEPA
CLEAN AIR ACT
NATIONAL HISTORIC PRESERVATION ACT
COASTAL ZONE MANAGEMENT ACT
NOISE CONTROL ACT
CLEAN WATER ACT
ENDANGERED SPECIES ACT
E.O.11990 PROTECTION OF WETLANDS
MARINE MAMMAL PROTECTION ACT
E.O.11988 FLOODPLAIN MANAGEMENT

Environmental Risks to Mission

- Under federal law, all NASA activities with a potential to affect the environmental must meet the requirements of the National Environmental Policy Act (NEPA)
- NEPA Requires:
  - Environmental evaluation for all activities
  - Environmental Assessment (EA)
  - Environmental Impact Statement
- EIS normally takes 18 months to 2 years to prepare, requires close coordination with State and local officials and the public
- NEPA is an intensely procedural process
- If you follow the process, you do not have to select the environmentally “best “ alternative

Risk Mitigation Strategy: Perform EIS now, at the Program level (e.g. for Constellation); projects can be added later using EAs

Benefit: Costs less, more efficient, saves time

Category Risks to Future NASA Missions

Societal Trend	Risks to NASA	Risk Mitigation
Increased urbanization	Increased population density around centers precludes activities that support mission.	Negotiate with local and state community for mutual agreeable buffer use.
Increased regulation	Hazardous and toxic material may create future liabilities. Many currently available materials cannot be used.	Material substitution where possible. New material development.
Potable water scarcity (NM, VA, CA, & FL)	Unable to fulfill missions at facilities in NM, VA, CA, & FL.	Rain water use, gray water use, water recycling, and improved efficiency.
Consumption of nonrenewable energy	Increased and unpredictable cost for energy. Decreased ability to perform mission.	Start investment in renewable energy such as wind and solar power
Increased environmental concerns	Unanticipated regulation reduces options and increases cost for response	Move beyond regulation to proactive management of environmental risks
Resource scarcity (materials)	Material cost will increase or materials will become unavailable.	Invest in technology development for sustainability.

The goal of I & A Risk Management is to increase NASA's capacity to perform its exploration missions

Challenges

- Reduce institutional threats to mission
- Drive down overall operations costs, both institutional and mission costs
- Expand NASA’s capacity to achieve mission with constrained resources in the context of managing uncertainties across complex systems
- Use reductions in operations costs as a funding wedge to purchase more mission in the future
- Increase institutional trade space to enhance Agency performance

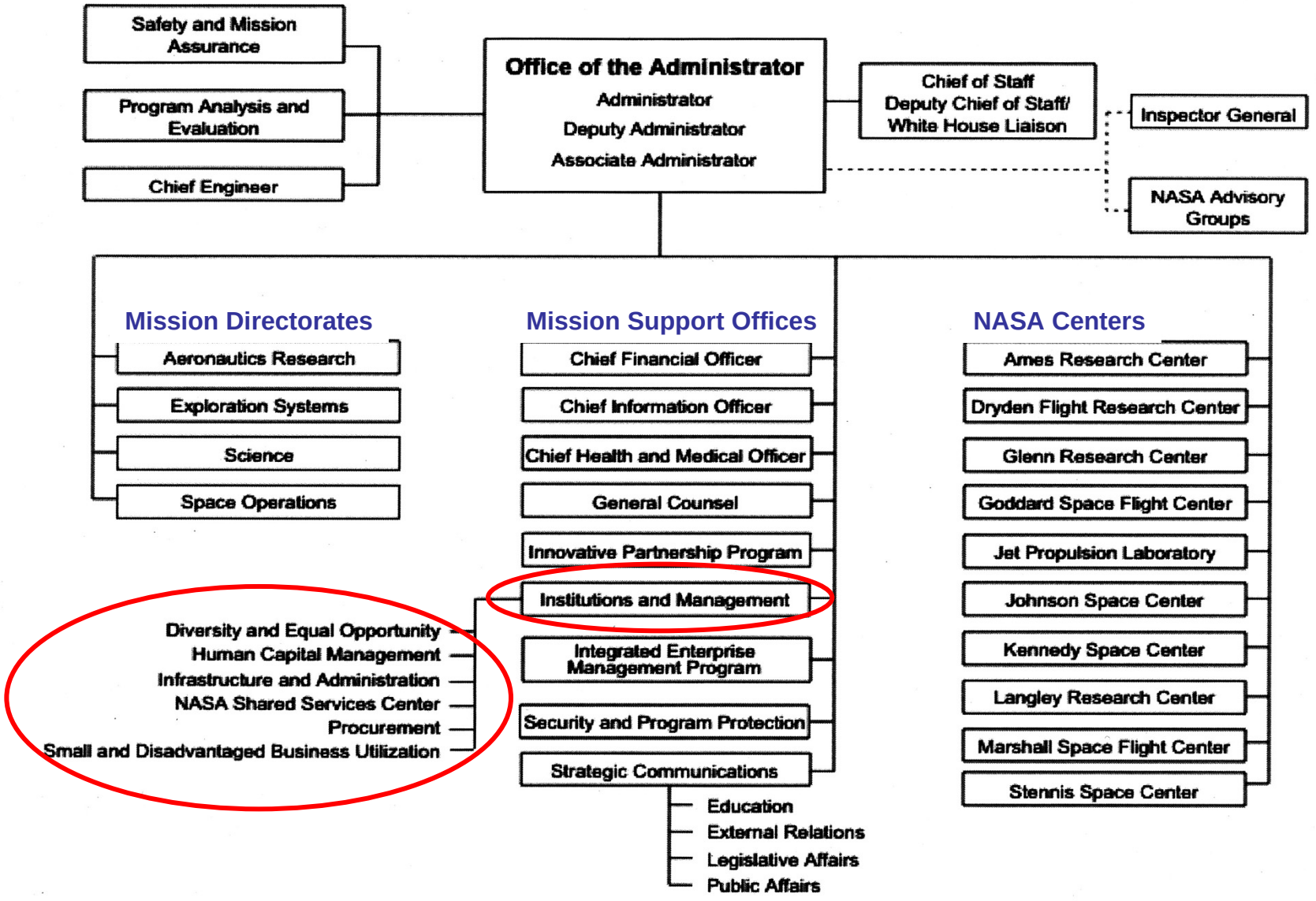
What Does This Mean?

- In order to execute NASA's challenging missions successfully in highly constrained environment, we must squeeze every iota of performance out of the institutional base to:
  - Increase the size of the decisional trade space across the institutional base
  - Leverage resources Agency-wide
  - Enhance institutional capacity to support mission
  - Sustain NASA's mission

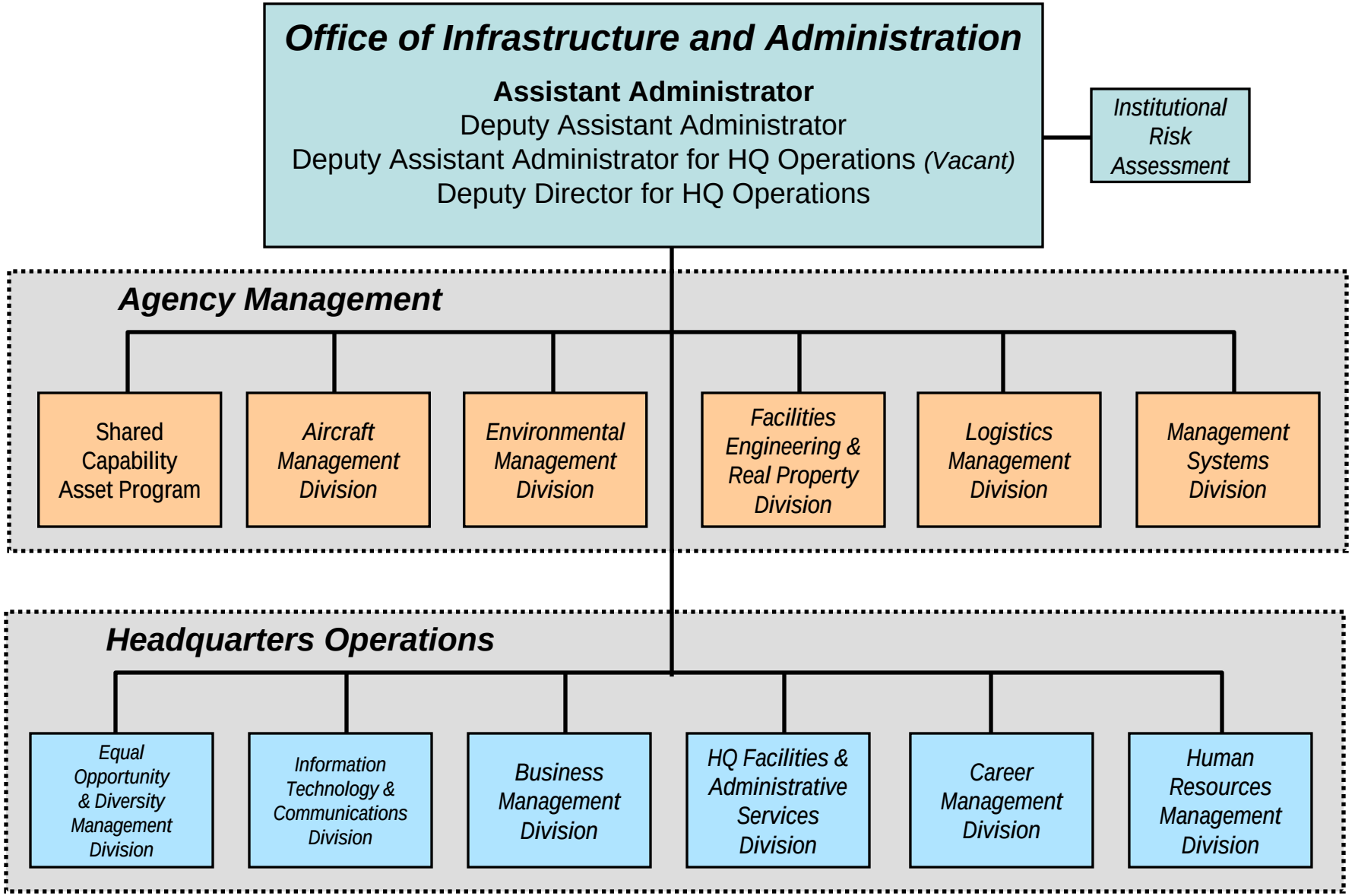
Managing Institutional Risk

- Program and Project Managers should:
  - Understand and plan for institutional requirements as early as possible in the program plan (pre-phase A)
  - Establish and document institutional needs
  - Consult early and often with appropriate institutional manager
  - Clearly identify, track and work jointly to mitigate institutional risks over time

NASA



* In accordance with law, the offices of Diversity and Equal Opportunity and Small and Disadvantaged Business Utilization maintain reporting relationships to the Deputy Administrator and Administrator.


Office of Infrastructure and Administration
Assistant Administrator
Deputy Assistant Administrator
Deputy Assistant Administrator for HQ Operations (Vacant)
Deputy Director for HQ Operations
Institutional Risk Assessment
Agency Management
Shared Capability Asset Program
Aircraft Management Division
Environmental Management Division
Facilities Engineering & Real Property Division
Logistics Management Division
Management Systems Division
Headquarters Operations
Equal Opportunity & Diversity Management Division
Information Technology & Communications Division
Business Management Division
HQ Facilities & Administrative Services Division
Career Management Division
Human Resources Management Division

Office of Infrastructure and Administration

- Manages the institutional support of mission
- Works with mission to identify institutional risks to programs and projects
- In many cases, manages the institutional risks for mission
- Brings knowledge, experience and leverage with regulators to the table
- Negotiates waivers and exemptions where external regulations threatens mission

I & A Goals

- Reduce institutional risk to mission
- Assure that I & A resources and assets are available to mission when needed to enable mission and the Vision for Space Exploration (VSE)
- Eliminate future infrastructure risk to mission through the proactive deployment of sustainable practices (e.g. materials assurance)

I & A Risk Categories

- Operations and Infrastructure (e.g. Deteriorating Facilities)
- Emerging Regulations (e.g. Perchlorate)
- Encroachment on Mission (e.g.Deep Space Network)
- Materials Systems Engineering (Ozone depleting substances -- shuttle foam and propellant binder)
- Environmental Liability/Cleanup Costs (White Sands/ groundwater contaminants, TCE)
- Natural Events (e.g. Hurricanes,)
- Regional Climate Variability (weather conditions, availability of launch and return windows, possible sea level change)

Proactive Risk Management

- I & A reduces risk to mission through:
  - Infrastructure availability assurance
  - Materials availability assurance
  - Influencing development of national and foreign regulations
  - Developing partnerships for materials substitution
  - Mitigating facilities encroachment
  - Implementing Integrated Asset Management

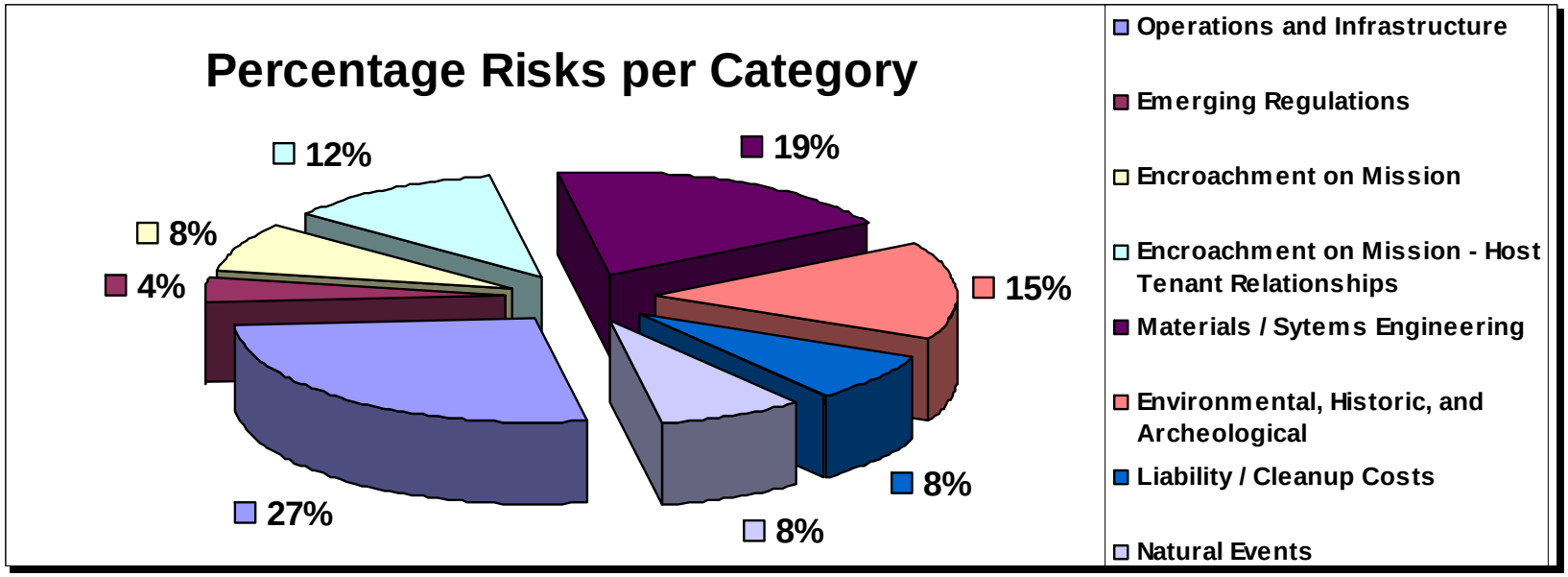
Organizational Interfaces

I & A Risk Distribution and Priority

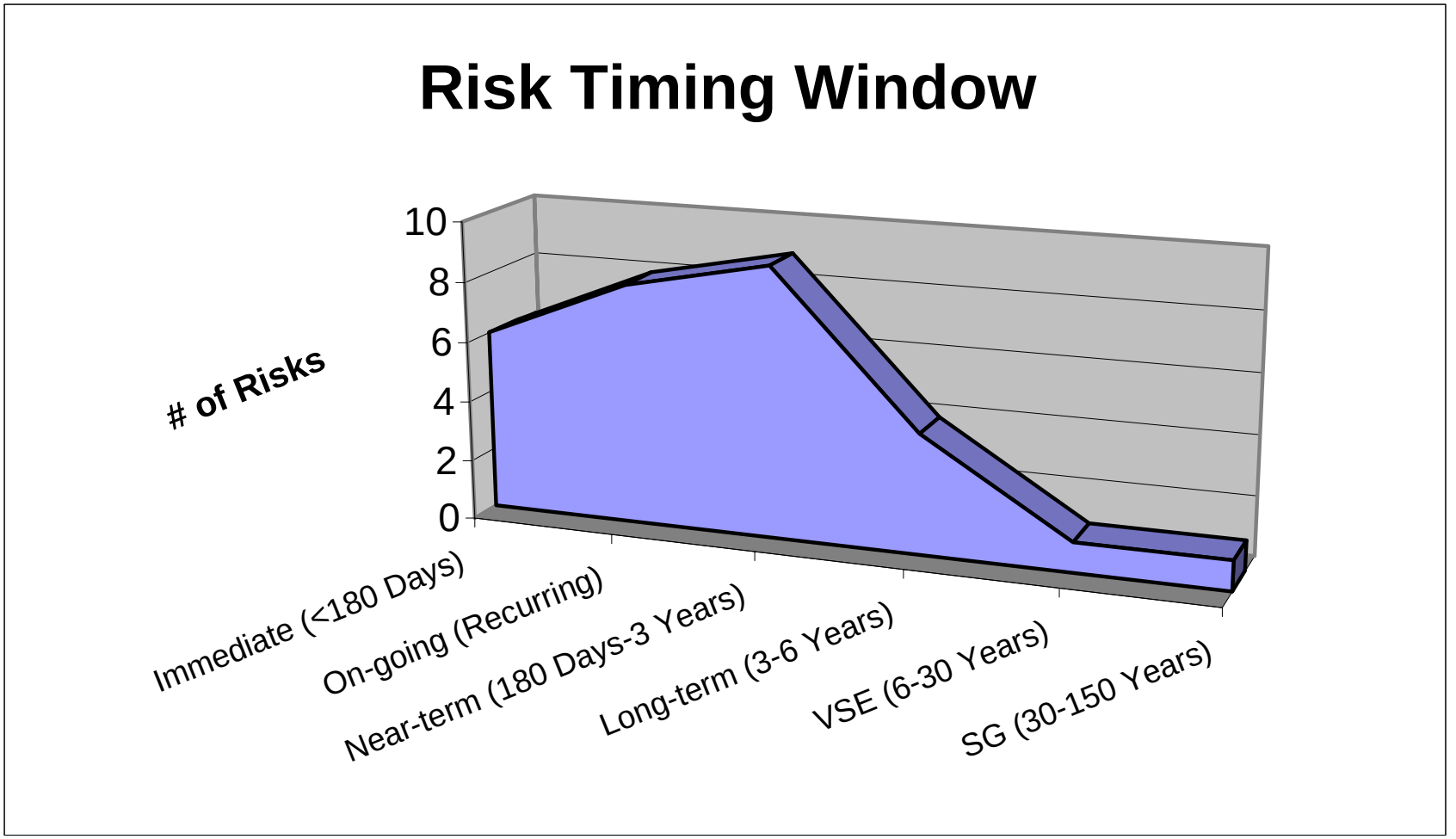
Distribution of I&A Risks

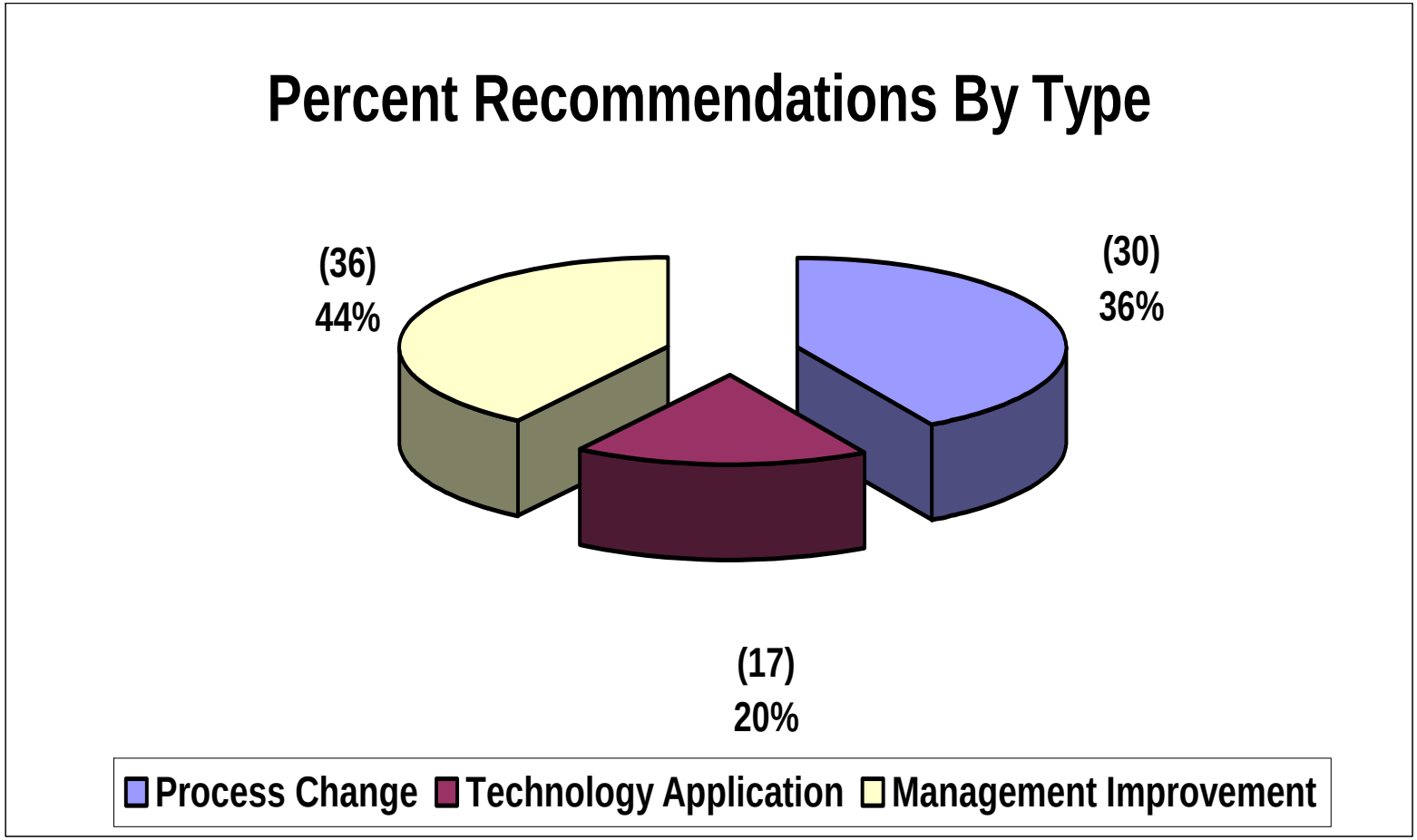
Probability (Likelihood)						
	5	0	4	3	3	3
	4	0	0	2	8	2
	3	0	0	2	0	0
	2	0	0	0	0	0
	1	0	0	0	1	0
		1	2	3	4	5

Impact (Consequence, severity)



Institutional Risks





NOTE: 80 % of risks are mitigated if we talk to one another

What We Manage For Mission

- Military Base Closure/Realignment (# 899)
  - Risk Consequence: Possible unavailability of infrastructure or services required for Center operation in support of mission, leading to cost and schedule risk
- EPA Risk Assessments (#897)
  - Risk Consequence: Forced material substitutions, cost and schedule risk
- Encroachment on NASA Centers (#898)
  - Risk Consequence: Inability to perform mission at Centers

What We Manage For Mission

- Unfunded Liability of Past Hazardous Materials (#903)
  - Risk Consequence: Further clean-up may be needed, resulting in less budget for mission
- Grants and National Environmental Policy Act (NEPA) Requirements (#902)
  - Risk Consequence: NEPA review is required for all grants; lack of review can stop projects and facilities, causing risk to project cost and schedule
- Aging /Obsolescence of Agency Business Systems (# 945)
  - Risk Consequence: Inability to identify and quantify resources means NASA may not be able to obtain what it needs, when we need it. May cause schedule cost and performance issues for mission

What We Manage For Mission

- Rising Energy Costs (#946)
  - Risk Consequence: Increasing energy costs will continue to erode mission budget

- KSC Vulnerability to Natural Disasters (#941)
  - Risk Consequence: Manned spaceflight launch activities could be suspended for extended periods of time

What Mission Manages With Us

- NEPA and Historic Preservation (#901)
  - Risk Consequence: If the NEPA process is not followed in the early design phases of programs and projects, there is a high potential for court action to delay or shut down the project/program (Schedule, cost and budget-- e.g. KECK Interferometer sp)
- Identification of Life Cycle Costs (Design for Operations)
  - Risk Consequence: Failure to identify true life cycle costs (including disposition and remediation) related to infrastructure in the early phases of exploration planning increases the possibility of schedule delays, increased life cycle costs, increased environmental liability, and increased costs for remediation (at direct cost to the program)

What Mission Manages With Us

- Interfaces, Requirements and Constraints for Ground Infrastructure
  - Risk Consequence: When interfaces, requirements and constraints for ground infrastructure are developed late in the systems engineering process, and the schedule and cost requirements are underestimated, projects suffer from inadequate budget estimates, schedule delays for infrastructure modifications, and negative impacts to life cycle costs and performance.
- Material Substitutions Within Critical Flight Systems and Components
  - Risk Consequence: Failure to communicate materials substitutions up the vendor supply chain may compromise performance and safety of critical flight components and subsystems resulting in schedule delays and added costs.

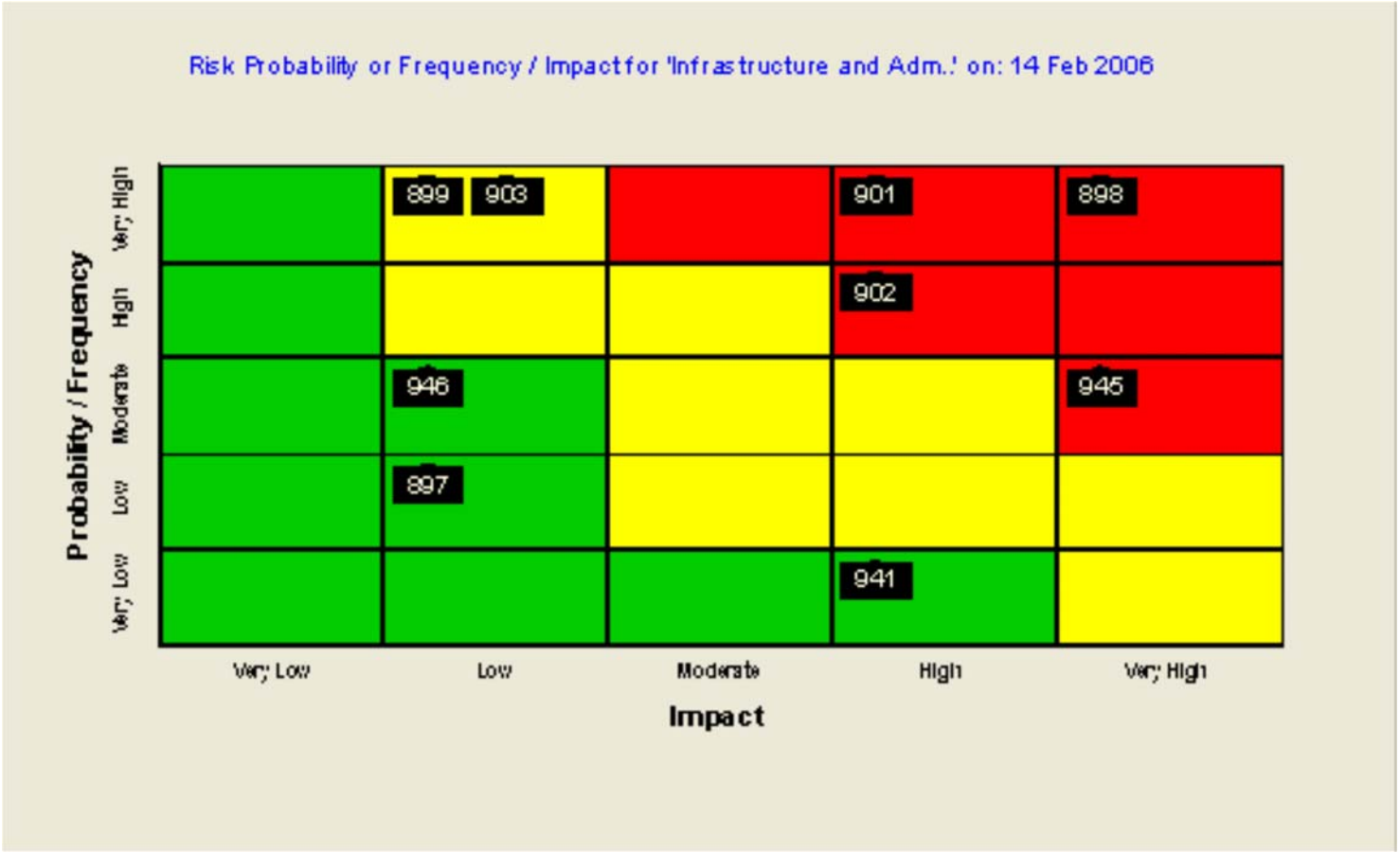
What Mission Manages With Us

- Materials Substitution in Systems Design
  - Risk Consequence: Failure to identify materials and processes which are not hazardous to the environment or to human health puts project schedule and cost at risk; materials known to be hazardous must be reduced during a program's life cycle.
- Frequency Protection at Goldstone
  - Risk Consequence: Failure to plan for incompatibility of Fort Irwin's expanded use of spectrum with requirements of the Deep Space Network co-located at Fort Irwin threaten NASA's DSN capability.

Pilot Risk Management Initiative

- I & A developed pilot risk initiative with Exploration Systems Mission Directorate (ESMD) to explore management strategies carefully designed to systematically identify and reduce institutional risk to mission
- Spring 2005, formed a Risk Management Team and mapped institutional risks to mission, using formal risk management and analysis tools
  - 26 I & A risks to mission identified
- Winter, 2005-Spring 2006, I& A partnered with ESMD and entered I & A risks into ESMD Risk Management Database; I & A serves on ESMD Risk Management Board
- Risk mitigation activities currently underway across the Institutional Base through the implementation of the Mission Support Implementation Plan.

ARM Screen Capture of I & A Risks



Top I & A Risks in ESMD Active Risk Manager (ARM)

Risk ID	Risk Title	zzz
898	Encroachment on NASA Centers/Facilties	5 x 5
901	NEPA & Historic Preservation	5 x 5
945	Aging/Obsolescence of Agency Institutional Business Systems	5 x 3
902	Grants & NEPA Requirements	4 x 4